* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The hybrid which branches mutually [phases differ 180 degrees mutually and] two fifths of the local oscillation signals of a frequency of an input signal to two of these amplitude, Two mixing components as which it consisted of two non-line type components connected to anti-parallel, two signals which branched by said hybrid were inputted into one terminal, respectively, and said input signal was inputted into both other-end children, The frequency converter which has the 1st filter which takes out the signal of a desired frequency band from the signal which compounded the opening stub 5/4 time the die length of the wavelength of said input signal connected between said hybrid and said each mixing component, and the output of said mixing component.

[Claim 2] Said mixing component is a frequency converter according to claim 1 which is antiparallel diode.
[Claim 3] Said 1st filter is a frequency converter according to claim 1 or 2 which is the low pass filter which takes out the signal of an intermediate frequency band.
[Claim 4] It is the frequency converter according to claim 3 with which said input signal is inputted into said mixing component from the node of the other-end child of said mixing component, and said 1st filter takes out the signal of a desired frequency band from said node.
[Claim 5] A frequency converter given in any 1 term of claims 1-4 which has further the 2nd filter which takes out the signal of a desired frequency band from said input signal, and is inputted into said mixing component.
[Claim 6] Said 2nd filter is a frequency converter according to claim 5 which is a high-pass filter.
[Claim 7] The receiver which is said frequency converter indicated by any 1 term of claims 1-6, and has the 1st frequency converter which carries out frequency conversion of said input signal to an intermediate frequency using two fifths of the local oscillation signals of a frequency of an input signal, and the 2nd frequency converter which carries out frequency conversion of the input signal changed into the intermediate frequency with said 1st frequency converter to a baseband frequency using the signal which carried out dividing of said local oscillation signal.
[Claim 8] The receiver which is said frequency converter indicated by any 1 term of claims 1-6, and has the 1st frequency converter which carries out frequency conversion of said input signal to an intermediate frequency using two fifths of the local oscillation signals of a frequency of an input signal with which multiplying of the predetermined oscillation signal was carried out, and it was generated, and the 2nd frequency converter which carries out frequency conversion of the input signal changed into the intermediate frequency with said 1st frequency converter using said oscillation signal to a baseband frequency.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the receiver used for radio, and its frequency converter.
[0002]
[Description of the Prior Art] Generally, the superheterodyne system is used as a radio-frequency head of a walkie-talkie. However, in recent years, in order to attain miniaturization of the wireless section, and high integration, a direct conversion method is improved and the development is furthered.
[0003] Moreover, the walkie-talkie which simplified the configuration and aimed at the cost cut is shown in JP,2000-68886,A.
[0004] Drawing 5 is the block diagram which was indicated by JP,2000-68886,A and in which showing the configuration of the conventional walkie-talkie.
[0005] The conventional walkie-talkie is equipped with the transceiver antenna 911, transmitting system 910A, receiving system 911A, the transceiver changeover switch 912, and local-oscillator 927A.
[0006] The transceiver changeover switch 912 makes connection with transmitting system 910A and receiving system 911A to the transceiver antenna 911. Local-oscillator 927A supplies a local oscillation signal to transmitting system 910A and receiving system 911A.
[0007] Local-oscillator 927A is equipped with voltage controlled oscillator 918A, the counting-down circuit 923, the variable divider 922, the phase comparator 920, and the loop filter 919, and constitutes the frequency synthesizer.
[0008] A counting-down circuit 923, a variable divider 922, a phase comparator 920, and a loop filter 919 constitute the phase-locked loop to voltage controlled oscillator 918A, and are stabilizing the output frequency of voltage controlled oscillator 918A. Moreover, a counting-down circuit 923 also performs conversion of a local oscillation signal while constituting a phase-locked loop.
[0009] Receiving system 911A is equipped with the band limit filter 913, amplifier 914, the 1st frequency converter 915, the band limit filter 916, and the 2nd frequency converter 917. The band limit filter 913 band-limits an input signal. Amplifier 914 amplifies the output of the band limit filter 913. The 1st frequency converter 915 carries out frequency conversion of the output of amplifier 914 to the 1st intermediate frequency signal. The band limit filter 916 band-limits the 1st intermediate frequency signal. The 2nd frequency converter 917 carries out frequency conversion of the output of the band limit filter 916 to the 2nd intermediate frequency signal.
[0010] Transmitting system 910A is equipped with the 3rd frequency converter 924, amplifier 925, and modulator 926. The 3rd frequency converter 924 creates a transmitted subcarrier from the output of a counting-down circuit 923, and the output of voltage controlled oscillator 918A. Amplifier 925 amplifies a transmitted subcarrier. A modulator 926 modulates the output of amplifier 925.
[0011] In the walkie-talkie of drawing 5 , local-oscillator 927A creates the signal for the 1st intermediate frequency signal creation by voltage controlled oscillator 918A, and is outputting it to the 1st frequency converter 915 of receiving system 911A. Moreover, local-oscillator 927A carries out dividing of the output of voltage controlled oscillator 918A with a counting-down circuit 923, creates the signal for the 2nd intermediate frequency signal creation, and is outputting it to the 2nd frequency converter 917 of receiving system 911A. Thus, the walkie-talkie of drawing 5 is single local-oscillator 927A, and since the signal for the 1st and 2nd intermediate frequency signal creation is created, circuitry is simplified. Moreover, circuitry is further simplified because the walkie-talkie of drawing 5 changes a local oscillation signal with the counting-down circuit 923 of local-oscillator 927A.
[0012]
[Problem(s) to be Solved by the Invention] The bipolar transistor of silicon available with a microwave band

cannot use on a property with a millimeter wave band. Therefore, if it is going to apply a direct conversion method to a millimeter wave, it is necessary to use the semi-conductor of gallium arsenide. Since the 1/f-noise property of a GaAs semiconductor is bad, if the walkie-talkie using a GaAs semiconductor is made into the same circuitry as the case of a silicon semi-conductor, it cannot realize an equivalent property.

[0013] On the other hand, in the 60GHz receiver by the configuration of drawing 5 , since an intermediate frequency is set to 12GHz, a silicon semi-conductor can be used.

[0014] Drawing 6 is the circuit diagram showing the configuration of an even-harmonic mixer usable as a frequency converter in the walkie-talkie of drawing 5 . The even harmonic mixer consists of the antiparallel diode 83, a low pass filter 84, a short stub 81, and an opening stub 82. The short stub 81 is connected to the local dispatch signal side of the antiparallel diode 84. Moreover, the opening stub 82 and the low pass filter 84 are connected to the intermediate frequency side of the antiparallel diode 83.

[0015] The case where the even harmonic mixer of drawing 6 is used as the 1st frequency converter 915 in drawing 5 is considered. In the even harmonic mixer of drawing 6 , if a frequency becomes high, the phase shift of the reflected wave which reflects with a latter component and returns to an even harmonic mixer will become large, and the noise of a radio frequency will increase.

[0016] Moreover, generally as for the short stub 81 and the opening stub 82, an input impedance changes with the relation between die length and a frequency. When die length tends to be adjusted to a predetermined frequency and it is going to obtain a predetermined input impedance, longitudinal adjustment becomes delicate, so that a frequency is high, and it becomes easy to produce an error.

[0017] From the above thing, if intermediate frequencies are 12GHz and high frequency like the 1st frequency converter 915 shown in drawing 5 , the property of an even harmonic mixer will deteriorate, and conversion loss becomes large. This becomes a cause and the signal error of a walkie-talkie increases.

[0018] The purpose of this invention is offering the walkie-talkie which could be miniaturized, could be integrated highly and was excellent in the noise property.

[0019]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the frequency converter of this invention The hybrid which branches mutually [phases differ 180 degrees mutually and] two fifths of the local oscillation signals of a frequency of an input signal to two of these amplitude, Two mixing components as which it consisted of two non-line type components connected to anti-parallel, two signals which branched by said hybrid were inputted into one terminal, respectively, and said input signal was inputted into both other-end children, It has the 1st filter which takes out the signal of a desired frequency band from the signal which compounded the opening stub 5/4 time the die length of the wavelength of said input signal connected between said hybrid and said each mixing component, and the output of said mixing component.

[0020] Therefore, since the frequency converter of this invention sets the frequency of an office dispatch number to two fifths of the frequencies of an input signal and 5/4 of the wavelength of an input signal of the opening stubs of die length are used for it, while an input signal is reflected and sensibility goes up, without affecting an office dispatch number by the opening stub, the effect by reflection with a preceding paragraph component is prevented, and it can suppress the error rate of a signal low.

[0021] Moreover, the frequency converter of this invention branches to two from which a phase differs a local oscillation signal about 180 degrees by the hybrid, it compounds the output of the mixing component corresponding to each, and the local oscillation signal with which it is that of output **** and phases differ about 180 degrees can negate it mutually, it can prevent that a local oscillation signal is revealed to an output, and can suppress the error rate of an input signal low.

[0022] Moreover, in two fifths of the office dispatch numbers of a frequency of an input signal, since the frequency converter of this invention carries out frequency conversion of the input signal, it can change the input signal of a millimeter wave band into the intermediate frequency which can use a silicon semi-conductor with a sufficient noise property.

[0023] Moreover, since it is prevented that the station dispatch number from which a phase differs about 180 degrees negates each other, and a station dispatch number is revealed to an output, the frequency converter of this invention has an unnecessary short stub.

[0024] Moreover, since the short stub is unnecessary only at an opening stub, adjustment of a property is easily possible for the frequency converter of this invention by the opening stub with easy longitudinal adjustment.

[0025] If this invention is caused like 1 voice, said mixing component will be antiparallel diode.

[0026] If this invention is caused like 1 voice, said 1st filter will be a low pass filter which takes out the signal of an intermediate frequency band.

[0027] If this invention is caused like 1 voice, said input signal will be inputted into said mixing component from

the node of the other-end child of said mixing component, and said 1st filter will take out the signal of a desired frequency band from said node.
[0028] The frequency converter [like] has further the 2nd filter of this invention which takes out the signal of a desired frequency band from said input signal, and is inputted into said mixing component 1 voice.
[0029] Therefore, since the effect of the impedance of the load connected to the input-signal side is reduced with the 2nd filter, the signal of an intermediate frequency band can be taken out efficiently.
[0030] If this invention is caused like 1 voice, said 2nd filter will be a high-pass filter.
[0031] The receiver of this invention is one frequency converter of this inventions, and has the 1st frequency converter which carries out frequency conversion of said input signal to an intermediate frequency, and the 2nd frequency converter which carries out frequency conversion of the input signal changed into the intermediate frequency with said 1st frequency converter to a baseband frequency using the signal which carried out dividing of said local oscillation signal using two fifths of the local oscillation signals of a frequency of an input signal.
[0032] Therefore, since the receiver of this invention has the the same source of a signal of the local oscillation signal of the 1st and 2nd frequency converters, degradation of the property by the phase noise of an oscillator does not serve as the sum of the noise of two oscillators, but there is little property degradation. Moreover, since the source of a signal is good at one, it can miniaturize from the receiver of a general double conversion method using two oscillators.
[0033] Other receivers of this invention are one frequency converters of this inventions, and have the 1st frequency converter which carries out frequency conversion of said input signal to an intermediate frequency using two fifths of the local oscillation signals of a frequency of an input signal with which multiplying of the predetermined oscillation signal was carried out, and it was generated, and the 2nd frequency converter which carries out frequency conversion of the input signal changed into the intermediate frequency with said 1st frequency converter using said oscillation signal to a baseband frequency.
[0034]
[Embodiment of the Invention] One operation gestalt of this invention is explained to a detail with reference to a drawing.
[0035] Drawing 1 is the block diagram showing the configuration of the receiver of 1 operation gestalt of this invention.
[0036] If drawing 1 is referred to, the receiver 100 of this operation gestalt has a low noise amplifier 10, the 1st frequency converter 11, the intermediate frequency band amplifier 12, the 2nd frequency converter 13, the oscillator 14, and the counting-down circuit 15.
[0037] A low noise amplifier 10 amplifies an input signal. The 1st frequency converter 11 changes the output of a low noise amplifier 10 into an intermediate frequency signal. The intermediate frequency band amplifier 12 amplifies an intermediate frequency signal. The 2nd frequency converter 13 changes the output of the intermediate frequency band amplifier 12 into baseband signaling. An oscillator 14 is supplied to a counting-down circuit 15 while it generates two fifths of the signalling frequency of the intermediate frequency fRF of an input signal and supplying it to the 1st frequency converter 11 as a local oscillation signal (a station dispatch number is called hereafter). A counting-down circuit 15 carries out dividing of the output of an oscillator 14 to one half, and supplies it to the 2nd frequency converter 13 as a station dispatch number.
[0038] As for the input signal inputted from the antenna (un-illustrating), a station dispatch number is inputted into the 1st frequency converter 11 of frequency 2/5fRF through a low noise amplifier 10. The output of the 1st frequency converter 11 is amplified with the intermediate frequency band amplifier 12. A station dispatch number is inputted into the 2nd frequency converter 13 of frequency 1/5fRF, and the output of the intermediate frequency band amplifier 12 is changed into a baseband band signal by the 2nd frequency converter 13.
[0039] Drawing 2 is the circuit diagram showing the configuration of the 1st frequency converter of this operation gestalt.
[0040] The 1st frequency converter 11 of this operation gestalt has a hybrid 1, the opening stubs 21 and 22, the antiparallel diodes 31 and 32, and a low pass filter 5.
[0041] Two fifths of the station dispatch numbers of center frequency fRF are inputted from a station dispatch number input terminal (LO IN), and a hybrid 1 outputs two signals with which phases differ 180 degrees mutually. As for the antiparallel diodes 31 and 32, series connection of one terminal is carried out to two outputs of a hybrid 1, respectively. It connects mutually in a node 4 and the other-end child of the antiparallel diode 31 and the antiparallel diode 32 is further connected to the input-signal input terminal (RF IN). The intermediate frequency output terminal (IF OUT) is connected through the low pass filter 5 from the input-signal input terminal (RF IN). Moreover, the opening stubs 21 and 22 5/4 time the die length of the wavelength of received frequency fRF are connected to each output of a hybrid 1, respectively.

[0042] Actuation of the receiver 100 of this operation gestalt is explained.
[0043] A receiver 100 is an oscillator 14, and it is supplied to a counting-down circuit 15 while generating two fifths of the signalling frequency of the center frequency fRF of an input signal and supplying the 1st frequency converter 11 as a station dispatch number. Moreover, a receiver 100 is a counting-down circuit 15, carries out dividing of the output of an oscillator 14 to one half, and supplies it to the 2nd frequency converter 13 as a station dispatch number.
[0044] And a receiver 100 amplifies an input signal with a low noise amplifier 10. Next, a receiver 100 changes the output of a low noise amplifier 10 into an intermediate frequency signal with the 1st frequency converter 11. Next, a receiver 100 is the intermediate frequency band amplifier 12, and amplifies an intermediate frequency signal. Next, a receiver 100 is the 2nd frequency converter 13, and changes the output of the intermediate frequency band amplifier 12 into baseband signaling.
[0045] Actuation of the 1st frequency converter 11 of this operation gestalt is explained.
[0046] The station dispatch number of fRF of frequencies 2/5 inputs into the 1st frequency converter 11 from a station dispatch number input terminal (LO IN). By the hybrid 1, phases differ about 180 degrees mutually, and the 1st frequency converter 11 branches a station dispatch number to two with the equal amplitude, and inputs each into the antiparallel diodes 31 and 32.
[0047] In addition, the die length of the junction of the antiparallel diodes 31 and 32, i.e., the distance of the antiparallel diodes 31 and 32 and a node 4, is short, and they is about 1 / ten to 1/20 to the wavelength of a station dispatch number. Phases differ about 180 degrees mutually, and since two signals from a hybrid 1 have the almost equal amplitude, they are mutually negated in a node 4.
[0048] Moreover, 5/4 of the wavelength of the input signal connected between a hybrid 1 and the antiparallel diodes 31 and 32 of the opening stubs 21 and 22 of die length are short in the frequency fRF of an input signal, and open in frequency 2/5fRF of a station dispatch number. Therefore, the opening stubs 21 and 22 make the station dispatch number from a hybrid 1 side transmit to antiparallel diode 31 and 32 side, and reflect the antiparallel diode 31 and the input signal from 32 sides.
[0049] The receiving input side of the antiparallel diodes 31 and 32 is short to a station dispatch number, and in a station dispatch number side, to an input signal, since it is short, the 1st frequency converter 11 operates as an even harmonic mixer.
[0050] The 1st frequency converter 11 supplies the input signal from an input-signal input terminal (RF IN) to two antiparallel diodes 31 and 32. And the 1st frequency converter 11 is the antiparallel diodes 31 and 32, mixes a station dispatch number and an input signal, and takes out only the signal of an intermediate frequency band with a low pass filter 5. Moreover, since an intermediate frequency band signal is 1/5 of the frequency of an input signal, it has a short phase relation in the node of the antiparallel diodes 31 and 32 and the opening stubs 21 and 22 by connecting the opening stubs 21 and 22. Therefore, it does not spread to a hybrid 1 side, but it is reflected by the opening stubs 21 and 22, and an intermediate frequency signal is outputted from a low pass filter 5.
[0051] Drawing 3 is the circuit diagram showing the configuration at the time of preparing a high-pass filter in an input-signal input in the 1st frequency converter of drawing 2 . If a high-pass filter 6 is formed in an input-signal input as shown in drawing 3 , since it will become that it cannot be easily influenced by the impedance of the load connected to an input-signal side, the signal of an intermediate frequency band can be efficiently taken out from the output IFOUT of a low pass filter 5, and a still better property is acquired.
[0052] Since the receiver 100 of this operation gestalt sets the frequency of the station dispatch number of the 1st frequency converter 11 to two fifths of the frequencies of an input signal and 5/4 of the wavelength of an input signal of the opening stubs 21 and 22 of die length are used While an input signal is reflected and sensibility goes up, without affecting an office dispatch number by the opening stubs 21 and 22, the effect by reflection with a preceding paragraph component is prevented, and the error rate of a signal can be suppressed low.
[0053] Moreover, since the receiver 100 of this operation gestalt changes an input signal into an intermediate frequency, when the frequency of the office dispatch number of the 1st frequency converter 11 is applied to a millimeter wave band as 2/5 of the frequency of an input signal, it can use a silicon semi-conductor with a sufficient noise property.
[0054] Moreover, the 1st frequency converter 11 of the receiver 100 of this operation gestalt Since an output is obtained from the node 4 which branched to two from which a phase differs a station dispatch number about 180 degrees by the hybrid 1, and connected the outputs of the antiparallel diodes 31 and 32 corresponding to each The office dispatch number from which a phase differs about 180 degrees can negate each other, it can prevent that an office dispatch number is revealed to an output, and the error rate of a signal can be suppressed low. Moreover, since the outputs of the antiparallel diode 3 are connected, a configuration is simple and can be

miniaturized.
[0055] Moreover, since it is prevented that the station dispatch number from which a phase differs about 180 degrees negates each other in a node 4, and a station dispatch number is revealed to an output, the 1st frequency converter 11 of the receiver 100 of this operation gestalt has an unnecessary short stub like the former. An opening stub is easy to adjust, although a short stub is generally difficult to adjust longitudinally when constituted from a pattern on a printed circuit board. Adjustment of a property is easily possible for the 1st frequency converter 11 of this operation gestalt by longitudinal adjustment of the opening stubs 21 and 22.
[0056] In addition, although antiparallel diode constituted the mixing component which carries out frequency conversion of the input signal by the station dispatch number from this operation gestalt, what is necessary is just the component which connected non-line type components of each other, such as diode, to anti-parallel.
[0057] The receiver 100 of this operation gestalt shown in drawing 1 carries out 2 dividing of the output of the oscillator 14 of frequency 2/5fRF which is the source of an office signal of the 1st frequency converter 11 with a counting-down circuit 15, and it is used for it as an office dispatch number of the 2nd frequency converter 13 of an intermediate frequency band. Therefore, like the common receiver of a double conversion method which used two oscillators, degradation of the property by the phase noise of an oscillator does not serve as the sum of the noise of two oscillators, but the receiver 100 of this operation gestalt has little property degradation. Moreover, since the receiver 100 of this operation gestalt has the good oscillator at one, it can miniaturize from the receiver of a general double conversion method using two oscillators.
[0058] Moreover, according to the receiver 100 of this operation gestalt, when an input signal is set to 60GHz, for example, since an intermediate frequency is set to 12GHz, the 2nd frequency converter 13 of an intermediate frequency band can use semi-conductors, such as diode made from silicon with little 1/f noise, and there is little degradation by the noise.
[0059] Drawing 4 is the block diagram showing the configuration of the receiver of other operation gestalten of this invention.
[0060] If drawing 4 is referred to, the receiver 200 of other operation gestalten of this invention has a low noise amplifier 10, the 1st frequency converter 11, the intermediate frequency band amplifier 12, the 2nd frequency converter 13, the oscillator 16, and the multiplier 17.
[0061] A low noise amplifier 10, the 1st frequency converter 11, the intermediate frequency band amplifier 12, and the 2nd frequency converter 13 are the same as what was shown in drawing 1 .
[0062] An oscillator 16 supplies an oscillator 14 to a multiplier 17 while it generates one fifth of the signalling frequency of the center frequency fRF of an input signal and supplying it to the 2nd frequency converter 13 as a station dispatch number. A multiplier 17 doubles multiplying of the output of an oscillator 16, and supplies it to the 1st frequency converter 11 as a station dispatch number.
[0063] In the receiver 200 of drawing 4 , as for the input signal inputted from the antenna (un-illustrating), an office dispatch number is inputted into the 1st frequency converter 11 of frequency 2/5fRF through a low noise amplifier 10 like the receiver 100 of drawing 1 . The output of the 1st frequency converter 11 is amplified with the intermediate frequency band amplifier 12. A station dispatch number is inputted into the 2nd frequency converter 13 of frequency 1/5fRF, and the output of the intermediate frequency band amplifier 12 is changed into a baseband band signal by the 2nd frequency converter 13.
[0064]
[Effect of the Invention] According to this invention, since the frequency of an office dispatch number is set to two fifths of the frequencies of an input signal and 5/4 of the wavelength of an input signal of the opening stubs of die length are used, while an input signal is reflected and sensibility goes up, without affecting an office dispatch number by the opening stub, the effect by reflection with a preceding paragraph component is prevented, and a frequency converter can suppress the error rate of a signal low.
[0065] Moreover, a frequency converter branches to two from which a phase differs a local-oscillation signal about 180 degrees by the hybrid, it compounds the output of the mixing component corresponding to each, the local-oscillation signal with which it is that of output **** and phases differ about 180 degrees negates it mutually, and it can prevent that a local-oscillation signal is revealed to an output, can suppress the error rate of an input signal low, and can perform the outputs of a mixing component with the simply connected configuration.
[0066] Moreover, in two fifths of the office dispatch numbers of a frequency of an input signal, since the frequency converter of this invention carries out frequency conversion of the input signal, it can change the input signal of a millimeter wave band into the intermediate frequency which can use a silicon semi-conductor with a sufficient noise property, and can acquire a good property.
[0067] Moreover, since the effect of the impedance of the load connected to the input-signal side is reduced

with the 2nd filter, the signal of an intermediate frequency band can be taken out efficiently and a still better property is acquired.

[0068] Moreover, since the receiver of this invention has the the same source of a signal of the local oscillation signal of the 1st and 2nd frequency converters, degradation of the property by the phase noise of an oscillator does not serve as the sum of the noise of two oscillators, but there is little property degradation and a good property can be acquired. Moreover, since the source of a signal is good at one, it can miniaturize from the receiver of a general double conversion method using two oscillators.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the configuration of the receiver of 1 operation gestalt of this invention.
[Drawing 2] It is the circuit diagram showing the configuration of the 1st frequency converter of this operation gestalt.
[Drawing 3] It is the circuit diagram showing the configuration of the 1st frequency converter which prepared the high-pass filter in the input-signal input.
[Drawing 4] It is the block diagram showing the configuration of the receiver of other operation gestalten of this invention.
[Drawing 5] It is the block diagram which was indicated by JP,2000-68886,A and in which showing the configuration of the conventional walkie-talkie.
[Drawing 6] In the walkie-talkie of drawing 5 , it is the circuit diagram showing the configuration of an even-harmonic mixer usable as a frequency converter.
[Description of Notations]
1 Hybrid
21 22 Opening stub
31 32 Antiparallel diode
4 Node
5 Low Pass Filter
6 High-pass Filter
10 Low Noise Amplifier
11 1st Frequency Converter
12 Intermediate Frequency Band Amplifier
13 2nd Frequency Converter
14 Oscillator
15 Counting-down Circuit
16 Oscillator
17 Multiplier
100 Receiver
200 Receiver

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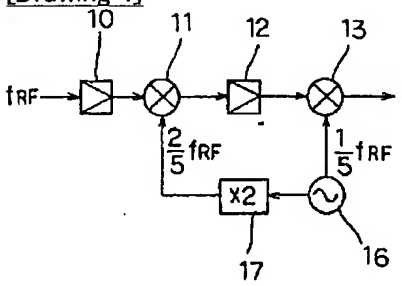
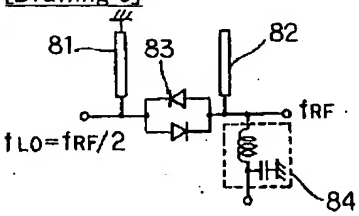
DRAWINGS

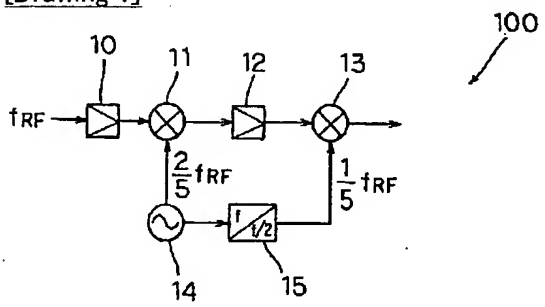
[Drawing 4]



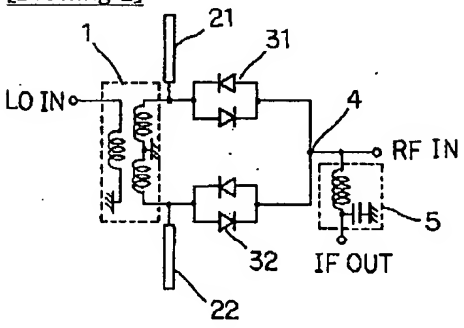
[Drawing 6]



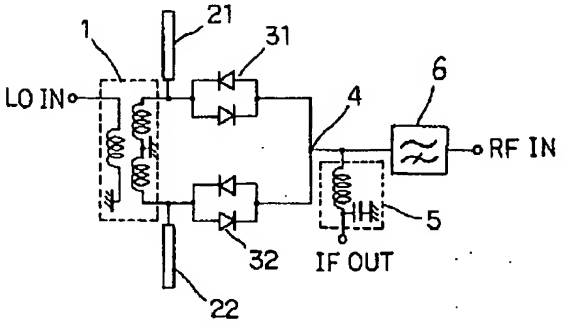
[Drawing 1]



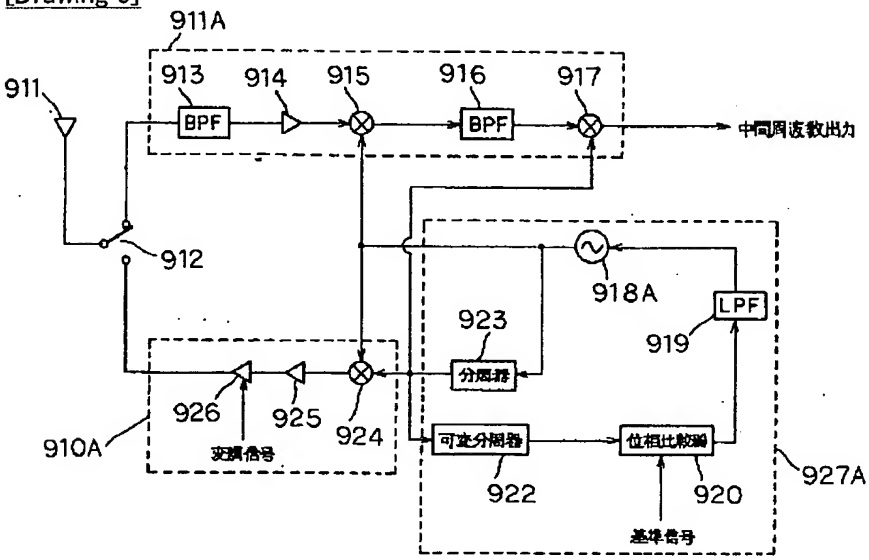
[Drawing 2]



[Drawing 3]



[Drawing 5]



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